

Pulmonary Blastoma in a Young Adult

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ABSTRACT

Pulmonary blastoma is a rare but aggressive malignancy of the lung comprising epithelial and mesenchymal elements that resemble fetal lung tissue. This report described a case of an 18-year-old male who presented with cough and weight loss for a month. Computed tomography (CT) of the thorax revealed a large mass with mixed solid and cystic lesions on the right side of chest along with pleural effusion and mediastinal lymphadenopathy. Massive debulking was performed followed by chemotherapy. A biphasic pulmonary blastoma was diagnosed on histopathology.

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Key words: Pulmonary blastoma, Sarcomatoid carcinoma, Computed tomography, Debulking.

INTRODUCTION

Pulmonary blastoma is a dysontogenetic neoplasm, first described by Barret and Barnard in 1945 as an embryoma but Spencer coined the term pulmonary blastoma in 1961. It is a rare, non-small cell malignant neoplasm of the lung, under the group of sarcomatoid carcinoma, and is characterised by a primitive variably mixed blastomatous undifferentiated cells and sarcomatoid appearance with the presence of epithelial mesenchymal transition.¹ We report a case of a characteristic biphasic pulmonary blastoma that presented with pleural disease as main abnormality.

CASE REPORT

An 18-year-old male presented with a four weeks history of shortness of breath, chest pain, fever of mild grade, non-productive cough and weight loss. He had received a course of oral antibiotics and supportive treatment without resolution of the symptoms. Clinical examination revealed a non-tender swelling of about 5cm size on the right side, in the upper part of chest along with dullness and decreased air entry on the same side suggestive of pleural effusion. He also had an ectopic testis on the left. On chest radiography, there was opacification of the right hemithorax (Figure 1) that on aspiration revealed haemorrhagic fluid with protein 3.7 gm%, sugar 102 mgm%, and an adenosine deaminase (ADA) within



Figure 1. Chest radiograph showing a massive pulmonary mass with pleural effusion in the right hemithorax.

normal limits. Cytopathology examination revealed mixed inflammatory and mesothelial cells. Mantoux test was negative. Blood haemogram and biochemistry were in the normal range.

A contrast enhanced CT of the thorax revealed a large right-sided pleural effusion with an almost totally collapse of the right lung along with a heterogeneously enhancing large mass measuring 12cm×14.2cm×17cm with solid and cystic components (Figures 2 & 3). There was extensive mediastinal lymph node enlargement including subcarinal, and paratracheal locations. Abdominal ultrasonography was normal except for a small left testis (1.6cm×0.8cm) in the superficial inguinal ring

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Figure 2. Contrast enhanced computed tomography showing a large, relatively well-defined heterogeneously enhancing soft tissue density mass lesion (approx. 12.0cmx14.2cmx 17.3cm) along with hypodense areas of necrosis and foci of amorphous calcifications in the right hemithorax abutting the costal pleural and mediastinal pleura.

on gray scale study. Doppler study showed normal vascularity pattern. Alpha fetoprotein levels were 17.3 ng/mL (N < 10.0 ng/mL) and beta HCG was 10.8 md/mL (N < 5.0 md/mL).

Bronchoscopy revealed compressed distal trachea, distorted carina, compressed right bronchial tree but no intra-luminal growth and complete occlusion of the right lower lobe lumen. Spirometry revealed a forced vital capacity (FVC) of 60% and forced expiratory volume in first second (FEV₁) of 40% of the predicted value.

The patient was operated upon. Intra-operative findings included a huge mass lesion occupying whole of the right side of the chest along with a moderate pleural effusion. The mass contained friable, necrotic and haemorrhagic tissues along with infiltration to the surrounding structures. The tumour could not be resected completely. Massive debulking



Figure 3. Computed tomography showing extension of the pulmonary mass into the anterior, middle and posterior mediastinum.

was performed and the mass was removed in pieces with sizes between 1 centimetre to 10 centimetres.

On gross pathologic examination of the large amount tissue piece on cross-section revealed multiple cystic cavities upto 2cm, with firm areas in-between. Microscopic examination showed wide areas of glandular differentiation, small-sized to cystically dilated, lined by cuboidal to columnar epithelium. There were areas of spindle shaped cells, round ovoid cells and solid areas with peripheral palisading (Figures 4 & 5). Abundant fibromatous stroma, neural components, focal areas of mucin secretion, optically clear nuclei, necrosis and vascular proliferation with haemorrhage were noted. Calcification was present. A diagnosis of biphasic pulmonary blastoma was established.

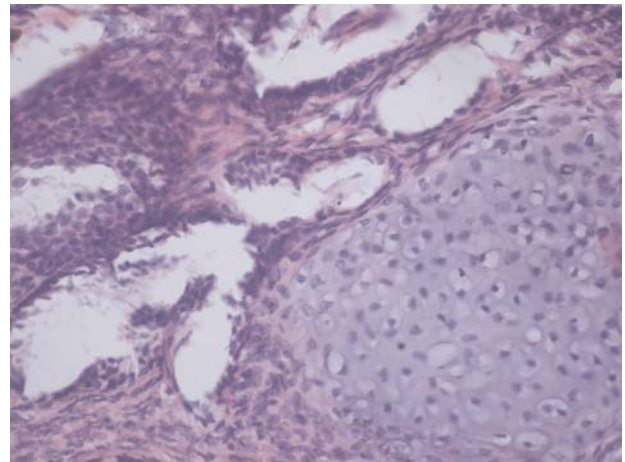


Figure 4. Histopathological sections showing a biphasic tumour section with few glandular structures embedded in stroma of spindle to round undifferentiated cells with blastemal elements suggestive of pulmonary blastoma (Haematoxylin and Eosin x 60).

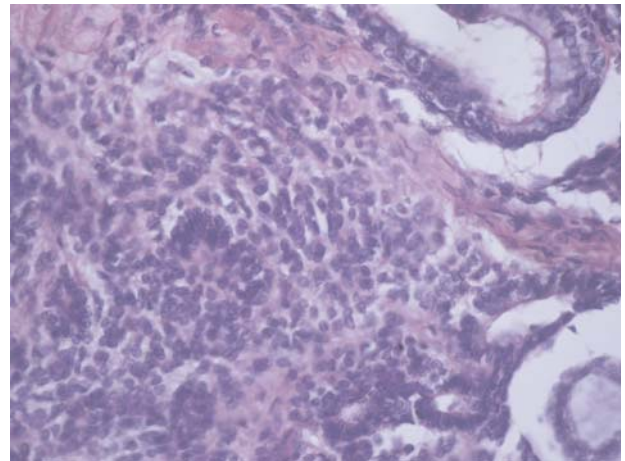


Figure 5. Histopathological section showing multiple ductal structures and stromal components comprising spindle cells. Morula formation was noted within the ducts. (Haematoxylin and Eosin x 400).

The results of tests for antibodies bindings (immunocytochemistry) were positive for chromogranin, synaptophysin, specific neuronal enolase,

keratin, vimentin, and smooth muscle actin, while carcinoma embryonic antigen (CEA) was negative. The patient received two cycles of cisplatin (50 mgm/m² on day 1), doxorubicin (40 mgm/m² on day 1), vinorelbine (1.4 mgm/m² half on day 1 and day 8) and etoposide (50 mgm/m² one days 1-5). The residual tumour regressed substantially. On follow-up at three months, the patient was progressing well.

DISCUSSION

Pulmonary blastoma is a rare primary malignant lung neoplasm originating from multi-potential pulmonary cells and is composed of immature mesenchyme and epithelium, that morphologically resemble to fetal lung tissue. More than 300 cases have been reported and it represents 0.25% to 0.5% of all primary lung tumours.² Pulmonary blastoma usually affects men and women smokers equally during the 4th decade of life. These tumours are defined as a transitional carcinoma because of the activation of an epithelial mesenchymal transition process is fundamental to their development and progression. These biphasic tumours are composed of a primitive epithelial component that resembles well-differentiated, low-grade fetal adenocarcinomas and a primitive mesenchymal stroma with blastomatous cells, with occasional foci of true sarcomatous differentiation. The second variety is the granulomatous sub-type of carcinosarcoma in which the sarcoma component is produced from a high grade fetal adenocarcinoma and clear cell adenocarcinoma with fetal lung features through epithelial mesenchymal transition.^{1,4} The epithelial cells are variably stained with cytokeratin, epithelial membrane antigen (EMA). The sarcomatoid or sarcomatous part is immunoreactive for vimentin. Adult biphasic pulmonary blastomas are considered as an entity from childhood pulmonary blastoma.^{4,7,10}

It occurs as a nodular tumour in the periphery of the lung and is a rapidly growing well-demarcated lung mass. Pulmonary blastoma is divided into two subtypes: epithelial predominant and biphasic.³ The World Health Organization (WHO) differentiates pulmonary blastoma from pleuropulmonary blastoma which are soft tissue tumours arising from the lung parenchyma and pleura in children. Based on the age, pulmonary blastoma can be divided into adult-types and child-types. Pulmonary blastomas are classified as carcinomas with pleomorphic, sarcomatoid or sarcomatous elements as described in the WHO classification. Pulmonary sarcomatoid carcinomas are currently defined as poorly-differentiated, non-small cell carcinomas containing a component with sarcoma or sarcoma-like (spindle and/or giant cell) features.^{1,4,7} A p53 gene mutation with or without p53 protein over-production has been

reported in classic biphasic pulmonary blastoma.^{1,4,7} Pulmonary blastoma is a mixed tumour of the lung that probably represents a distinct sarcomatous carcinoma. Others are carcinosarcoma, salivary gland type mixed tumours and teratoma, all of which are rare.

A large proportion of patients with pulmonary blastoma are usually asymptomatic (25% to 40%) with an incidental finding of lung mass on chest radiography. Symptomatics may present with cough, fever, dyspnoea, chest pain and haemoptysis with 15% to 20% below the age of 20 years, and more than 75% of the children below the age of 5 years. Symptoms and findings of weight loss, recurrent pneumonia, moderate pleural effusion, back pain may also be present. It occurs mainly in young women and a correlation with smoking has been noted.⁵

On radiography, a pulmonary blastoma may show up as a small solid tumour in a pre-existing cystic disease to a large space occupying lesion with opacification of the hemithorax. Punctate calcifications usually develop after chemotherapy. Larger lesions are more common in younger age groups. A pneumothorax may be seen. Ultrasound can reveal a heterogeneous appearance with solid and few cystic areas indicating necrotic elements.⁶ Computed tomographic images show a low attenuation mass with whorls of high attenuation solid tissue and non-enhancing areas of necrosis. Metastasis and mediastinal involvement may be there. Association with congenital cysts of the lung has been reported.⁷

Most reports have used surgical resection (wedge resection, lobectomy, thoroscopic resection) as the primary modality of treatment but both chemotherapy and radiation therapy have been used for adjuvant as well metastatic disease.^{8,9} Primary sleeve resection and a left sleeve pneumonectomy has been reported. Several cycles of chemotherapy comprising doxorubicin, cisplatin, vincristine, cyclophosphamide, etoposide and ifosfamide with MESNA usually give a good partial response.⁹ The efficacy of adjuvant chemotherapy and radiotherapy is not yet established but can be utilised to prolong survival.^{4,8}

Prognosis is somewhat unpredictable. Survival of 33 months for a resected tumour but only two months for non-resected tumour has been noted. On follow-up, a 33% survival in two years, 16% at five years and 8% at 10 years has been noted.⁴ Prognosis is poor if the size of the tumour is more than 5cm, regardless of age, metastatic disease, lymph node metastasis, N₁ nodal involvement, tumour recurrence and biphasic types of pulmonary blastoma.⁷ In a study of five cases of pulmonary blastoma, the survival was 198 months in T₁N₀M₀, 112 months in T₂N₀M₀ and 9,10 and 17 months in T₂N₁M₀.¹⁰

The present case illustrates an aggressive neoplasia in an advanced stage where surgical treatment and chemotherapy was used after evaluation by clinical examination, CT, spirometry, blood studies, bronchoscopic finding and surgical staging with referral for radiotherapy. This tumour is a subgroup of the biphasic pulmonary blastoma and is characterised by a unique histological heterogeneity with intermixing of both epithelial and mesenchymal tissues malignancy, and by its histological similarity to fetal lung tissue.

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